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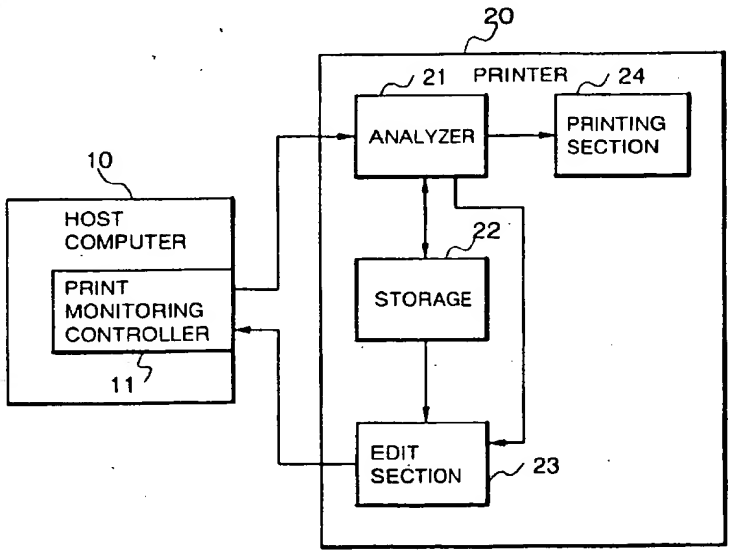
(54) Bidirectional printer interface

(57) A bidirectional printer interface comprises a print monitoring controller provided for a host unit for controlling a printer connected to the host unit to monitor a print state: an analyzer provided for the printer for analyzing environment data for setting a print environment and print data; a storage provided the printer for analyzing storing the print data analyzed by the analyzer; wherein the analyzer compares data in relation to a print environment included in the print data with the environment data stored in the storage to determine the presence of the difference therebetween, and if the difference between the data is detected, the analyzer transmits the content of the difference between the data to the host unit and wherein the printer monitoring controller notifies the user of the content of the difference between the data transmitted from the analyzer.

FIG.1



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Description

This invention relates to a bidirectional printer interface for interconnecting a printer and a host unit to bidirectionally communicate therebetween, in particular, to a bidirectional printer interface having a function of notifying print data abnormalities from a printer to a host unit.

Generally, this type of bidirectional printer interface is formed by a combination of a printer driver incorporated into a host computer as a host unit, and a firmware controller incorporated into a printer. The printer driver of the host computer sets print conditions, such as a printer model, paper size resolution, and a font type, and transmits print data to the print. The firmware controller of the printer print outputs the received print data, according to the print conditions set by the printer driver.

To set print conditions, in the host computer, a screen for setting a print environment is displayed on its display device; various conditions are set using an input device such as a keyboard or a mouse by entering appropriate commands and data. Then the set print conditions are transmitted through the bidirectional printer interface to the printer. The firmware controller of the printer retains the received print conditions and waits to transmit the print data.

An example of the conventional technology using a screen displayed on a display device of a host computer to set a print environment of a printer is disclosed as "APPARATUS FOR SETTING OPERATION ENVIRONMENT FOR PRINTER" in Japanese Unexamined Patent Publication (Kokai) No. Heisei 5-309920. In this publication, a configuration for setting a printer with a menu displayed on a display device comprising a selection means for selecting a function of the printer, an environment data storage means for storing an setting of an operation environment for the printer, a menu storage means for storing the menu where items for environmental setting are associated with display states of the display device, and a display means for displaying a result by the selection means thereon, is disclosed.

The printer transmits print conditions, such as at the beginning of printing and during printing, as well as notifications when the occurrence of physical abnormalities, such as running out of toner or the cover opening, is detected through the bidirectional printer interface to the host computer. The host computer receives these notifications to display on the screen of the display device or to voice output to notify the user.

Thus, in the conventional printer control technology, bidirectional data transmission/reception between a printer and a host computer for controlling the printer is conducted by a bidirectional printer interface.

However, as the printer cable connecting the printer to the host computer printer is a one-way cable, in the conventional bidirectional printer interface as described, while the print data is transmitted and then the print processing is performed, the transmission of the print data of interest cannot be suspended to transmit the data from the printer to the host computer. Therefore, if there is an error in print data or a contradiction to environment data, as the user cannot find them until the data is printed on a paper, print papers are wasted in vain.

Features of a bidirectional printer interface to be described below, as an example, are that it can check print data abnormalities prior to the execution of the print processing, and notify a host unit of print data abnormalities when they are detected.

A particular bidirectional printer interface to be described below as an example includes

a print monitoring controller means provided for a host unit for controlling a printer connected to the host unit to monitor a print state;
an analysis means provided for the printer for analyzing environment data for setting a print environment and print data;
a storage means provided the printer for analyzing storing the print data analyzed by the analysis means;
wherein the analysis means compares data in relation to a print environment included in the print data with the environment data stored in the storage means to determine the presence of the difference therebetween, and if the difference between the data is detected, the analysis means transmits the content of the difference between the data to the host unit;
and wherein the printer monitoring controller means notifies the user of the content of the difference between the data transmitted from the analysis means.

In the preferred construction, the bidirectional printer interface further comprises an output means for printing the content of the difference between the data, according to the result of the comparison of the print data by the analysis means with the environment data.

Also, the bidirectional printer interface further comprises a display means for displaying the content of the difference between the data according to the result of the comparison of the print data by the analysis means with the environment data.

In the above-mentioned construction, the analysis means analyzes the print data received from the host unit, and if a data error is detected, the analysis means transmits the content of the error to the host computer; and the print monitoring controller means notifies the user of the content of the data error transmitted from the analysis means.

Also, the bidirectional printer interface further comprises an output means for printing the content of the difference between the data and the content of the data errors according to the result of the comparison of the print data by the analysis means with the environment data and the presence of the data error in the print data.

Also, the bidirectional printer interface further comprises a display means for displaying the content of the difference between the data and the content of the data errors, according to the result of the comparison of the print data by the analysis means with the environment data and the presence of the data error in the print data.

In the above-mentioned construction, the print monitoring controller means is incorporated into an operating system of the host unit, storing a software for controlling the printer, for monitoring a print state, and for notifying the user of the difference of the print data and the environment data, and operating according to the software.

Another bidirectional printer interface to be described below as an example includes

a print monitoring controller means provided for a host unit for controlling a printer connected to the host unit to monitor a print state;
an analysis means provided for the printer for analyzing environment data for setting a print environment and print data;
a storage means provided the printer for analyzing storing the print data analyzed by the analysis means;
wherein the analysis means compares data in relation to a print environment included in the print data with the environment data stored in the storage means to determine the presence of the difference therebetween, and if the difference between the data is detected, the analysis means transmits the content of the difference between the data to the host unit;
and the analysis means also analyzes the print data from the host unit, in the case that any data error is detected, to transmit the content of the data errors to the host unit;
and wherein the printer monitoring controller means notifies the user of the content of the difference between the data transmitted from the analysis means and the content of the data errors.

The following description and drawings disclose, by means of examples, the invention which is characterised in the appended claims, whose terms determine the extent of the protection conferred hereby.

In the drawings:

Fig. 1 is a block schematic diagram showing one configuration of a bidirectional printer interface,

Fig. 2 is a flow chart showing the operation of this configuration,

Fig. 3 is a block schematic diagram showing another configuration of a bidirectional printer interface, and

Fig. 4 is a block schematic diagram showing yet another configuration of a bidirectional printer interface.

Referring to Fig. 1, there is shown, a bidirectional printer interface which includes a print monitoring controller 11 for controlling a printer to monitor the print state, an analyzer 21 analyzing environment data and print data for a print environment setting, a storage 22 for storing environment data, an edit section 23 for editing a result analyzed by the analyzer 21. The print monitoring controller 11 is also incorporated into a host computer 10 as a host unit; the analyzer 21, the storage 22, and the edit section 23 are incorporated into a printer 20. The host computer 10 and the printer 20 are connected by a printer cable or the like. However, in this figure, only a configuration characteristic of this embodiment is shown, while other configurations are omitted. Actually, the host computer 10 includes the configuration as shown as well as a processor to operate an application software for creating print data and a display device, the printer 20 including a function processor for monitoring the presence of abnormalities, such as running out of toner and papers or the cover opening.

The print monitoring controller 11 is implemented with a printer driver incorporated into an operating system in the host computer 10, followed by the operation according to an software stored in a storage of the host computer (not shown). That is, the print monitoring controller 11 creates environment data for setting an print environment including printer models, paper size resolutions, and types of font, to transmit the printer 20. It also analyze the data from the printer 20 to display the analyzed result on the display device (not shown), or to vocal it output from a loudspeaker (not shown).

The analyzer 21 is implemented with a CPU mounted in and controlled by the printer 20. The analyzer 21 analyzes the environment data from the host computer 10 and print data and compares environment data to the print data, before transmitting the analyzed environment data to the storage 22 or various notifications to the edit section 23 according to the analyzed result. Here, print data created by the application software includes data in relation to paper sizes and print directions. Therefore, the analyzer 21 compares the data in relation to print environment included in the received print data to the environment data pre-stored in the storage 22. If the analyzer 21 analyzes the print data, and if grammatical or command errors in print data, it notifies the edit section 23 that errors have occurred. If a difference between print data and analyzed data is detected, the analyzer 21 notifies the edit section 23 that the difference has been detected. The analyzer 21 is connected to a printing section 24 in the printer 20, which performs the print processing according to the analyzed print data transmitted from the analyzer 21.

The storage 22 is implemented with RAM or the like, storing to retain the analyzed environment data from the

analyzer 21.

The edit section 23 is implemented with a CPU or the like mounted on and controlled by the printer 20, creating error or check data for showing an analyzed result of interest according to the notifications and analyzed result to transmit the created data to the host commuter.

Now the operation of this embodiment will be described in reference to the flow chart of Fig. 2.

First, the print monitoring controller 11 creates environment data for setting print environment according to operations of an input device, such as a keyboard or a mouse (step 201). The created environment data is transmitted to the printer 20 (step 202).

The analyzer 21 of the printer 20 receives the environment data transmitted from the print monitoring controller 11 of the host computer 10 to perform the analysis processing (step 203). If an abnormal result is obtained as a result of analysis, for example, in the case that the set content of the print environment is over the limitation for setting conditions, the unfair environment data is notified through the edit section 23 to the host computer 10 to return to create environment data (step 204, 201)

On the other hand, if the environment data is determined to be normal as a result of analysis, the environment data of interest is converted to a format which can be stored into the storage 22, to store the data in the storage 22 (step 205, 206).

Next, in the host computer 10, print data depending on the application software is created to transmit to the printer 20 (step 207).

The analyzer 21 of the printer 20 receives the print data transmitted from the host computer 10 to perform the analysis processing (step 208). Here, when an error, such as a grammatical or command error, is detected, the error detection is notified of the edit section 23, which creates error data for making the host computer 10 check errors (step 209, 210). Also, the data in relation to print environment included in the print data is compared with the data stored in the storage 22. If the difference between the data is detected, the difference detection in the edit section 23 is notified, the edit section 23 creates check data for making the host computer 10 check the difference between the print data and the environment data (step 211, 212). The edit section 23 transmits the error or check data created to the host computer 10 (step 214).

The print monitoring controller 11 of the host computer 10 receives the error or check data transmitted from the printer 20 to analyze (step 215). Then, according to errors or the content of the difference between the print data and environment data, a message for announcing the errors or the content of difference is displayed on the display device or voice outputted to the user (step 216). For example, if the notification processing of these errors or the content of the difference of print data and environment data to the user is performed in an interactive manner, the user can check particular errors or the content of the difference.

On the other hand, if any errors or the difference with the environment data are not detected in print data, the printing section 24 in the printer 20 unarchives the print data of interest to image memory to print on a paper (step 213).

In the example of the operation, the print data transmission is always after the environment data transmission in each printing operation; however, once environment data is transmitted and stored in the storage 22 of the printer 20, only print data with the application software may be transmitted to compare the environment data pre-stored in the storage 22, except when new environment data is transmitted in order to update the environment data of interest.

As described, according to this embodiment, in the printer, print data abnormalities are checked: if print data abnormalities are detected, they are designed to be notified of the host unit; the user can check and correct print data abnormalities before the performance of the print processing. Therefore waste of papers by a simple setting misoperation, such as in the misunderstanding of the user can be reduced.

Fig. 3 is a block schematic diagram showing the configuration of a further bidirectional printer interface illustrative of the present invention.

As shown in Fig. 3, the bidirectional printer interface includes a print monitoring controller 11 for controlling a printer to monitor a print state, an analyzer 21 for analyzing environment data for setting print environment and print data, a storage 22 for storing environment data, and an edit section 23 for editing results analyzed by the analyzer. The print monitoring controller 11 is incorporated into the host computer 10 as a host unit, while the analyzer 21, storage 22 and edit section 23 are incorporated into the printer 20. As the function of each component is the same as each counter part of the first embodiment in Fig. 1, the identical numerics are assigned to omit their description.

In this embodiment, if the analyzer 21 detects errors of print data, and if the difference between print data and the environment data pre-stored in the storage 22, the edit section 23 creates the error and check data transmitted to the host computer 10; however, the error and check data are also transmitted to the printing section 24, which unarchives the error and check data to image memory to print on the paper.

In this embodiment, if any error or the difference with the environment data in with print data is detected, as the content of the error of interest or the like is printed, the user can reference the content to correct print data. Further, in this embodiment, compared to the embodiment in Fig. 1 as described, although a paper for printing the content including errors will be consumed, less waste of papers can be reduced in comparison with printing data using large amount of papers without noticing simple setting misoperation.

Fig. 4 is a block schematic diagram showing the configuration of yet another bidirectional printer inter-

face illustrative of the present invention.

As shown, in Fig. 4 the bidirectional printer interface includes a printer monitoring controller 11 for controlling a printer to monitor a print state, an analyzer 21 for analyzing environment data for setting print environment and print data, a storage 22 for storing environment data, an edit section 23 for editing results analyzed by the analyzer, and a display the result analyzed by the analyzer 21. The print monitoring controller 11 is incorporated into the host computer 10 as the host unit, while the analyzer 21, storage 22, edit section 23, and display 23 are incorporated into the printer 20.

The display 25 is implemented with a liquid crystal display device or a display lamp or the like, which display the presence of errors in print data or the difference between print data and environment data, according to the result analyzed by the analyzer 21. The user can reference the content displayed on the display 25 to check errors in print data or the presence of the difference with environment data. As the other function of each components is the same as the counter part in Fig. 1, the same numeric is assigned to omit the description.

The embodiments illustrative of the present invention and described above are designed to make the printer check print data abnormalities, in the case of the detection of print data abnormalities, to notify the host unit there, the user can check print data abnormalities before the execution of the print processing. Therefore waste of papers by a simple setting misoperation including a misunderstanding by the user can be advantageously reduced.

Although the invention has been described, by way of example, with reference to particular embodiments, it will be understood that variations and modifications thereof, as well as other embodiments may be conceived and made within the scope of the appended claims.

Claims

1. A bidirectional printer interface comprising:

   a print monitoring controller means provided for a host unit for controlling a printer connected to the host unit to monitor a print state;
   an analysis means provided for the printer for analyzing environment data for setting a print environment and print data;
   a storage means provided the printer for analyzing storing the print data analyzed by the analysis means;
   wherein the analysis means compares data in relation to a print environment included in the print data with the environment data stored in the storage means to determine the presence of the difference therebetween, and if the difference between the data is detected, the analysis means transmits the content of the difference between the data to the host unit;
   and wherein the printer monitoring controller means notifies the user of the content of the difference between the data transmitted from the analysis means.

2. A bidirectional printer interface as set forth in claim 1, wherein the printer further comprises:

   an output means for printing the content of the difference between the data, according to the result of the comparison of the print data by the analysis means with the environment data.

3. A bidirectional printer interface as set forth in claim 1, wherein the printer further comprises:

   a display means for displaying the content of the difference between the data according to the result of the comparison of the print data by the analysis means with the environment data.

4. A bidirectional printer interface as set forth in claim 1, wherein the analysis means analyzes the print data received from the host unit, and if a data error is detected, the analysis means transmits the content of the error to the host computer; and

   the print monitoring controller means notifies the user of the content of the data error transmitted from the analysis means.

5. A bidirectional printer interface as set forth in claim 4, wherein the printer further comprises:

   an output means for printing the content of the difference between the data and the content of the data errors according to the result of the comparison of the print data by the analysis means with the environment data and the presence of the data error in the print data.

6. A bidirectional printer interface as set forth in claim 4, wherein the printer further comprises:

   a display means for displaying the content of the difference between the data and the content of the data errors, according to the result of the comparison of the print data by the analysis means with the environment data and the presence of the data error in the print data.

7. A bidirectional printer interface as set forth in claim 1, wherein the print monitoring controller means is incorporated into an operating system of the host unit, storing a software for controlling the printer, for monitoring a print state, and for notifying the user

of the difference of the print data and the environment data, and operating according to the software.

8. A bidirectional printer interface comprising:

a print monitoring controller means provided for a host unit for controlling a printer connected to the host unit to monitor a print state;
an analysis means provided for the printer for analyzing environment data for setting a print environment and print data;
a storage means provided the printer for analyzing storing the print data analyzed by the analysis means;
wherein the analysis means compares data in relation to a print environment included in the print data with the environment data stored in the storage means to determine the presence of the difference therebetween, and if the difference between the data is detected, the analysis means transmits the content of the difference between the data to the host unit;
and the analysis means also analyzes the print data from the host unit, in the case that any data error is detected, to transmit the content of the data errors to the host unit;
and wherein the printer monitoring controller means notifies the user of the content of the difference between the data transmitted from the analysis means and the content of the data errors.

9. A bidirectional printer interface as set forth in claim 8, wherein the printer comprises:

an output means for printing the content of the difference between the data and the content of the data errors according to the result of the comparison of the print data by the analysis means with the environment data and the presence of the data error in the print data.

10. A bidirectional printer interface as set forth in claim 8, wherein the printer further comprises:

a display means for displaying the content of the difference between the data and the content of the data errors, according to the result of the comparison of the print data by the analysis means with the environment data and the presence of the data error in the print data.

11. a bidirectional printer interface as set forth in claim 8, wherein the print monitoring controller means is incorporated into an operating system of the host unit, storing a software for controlling the printer, for monitoring a print state, and for notifying the user of the difference of the print data and the environment data, and operating according to the software.

FIG.1

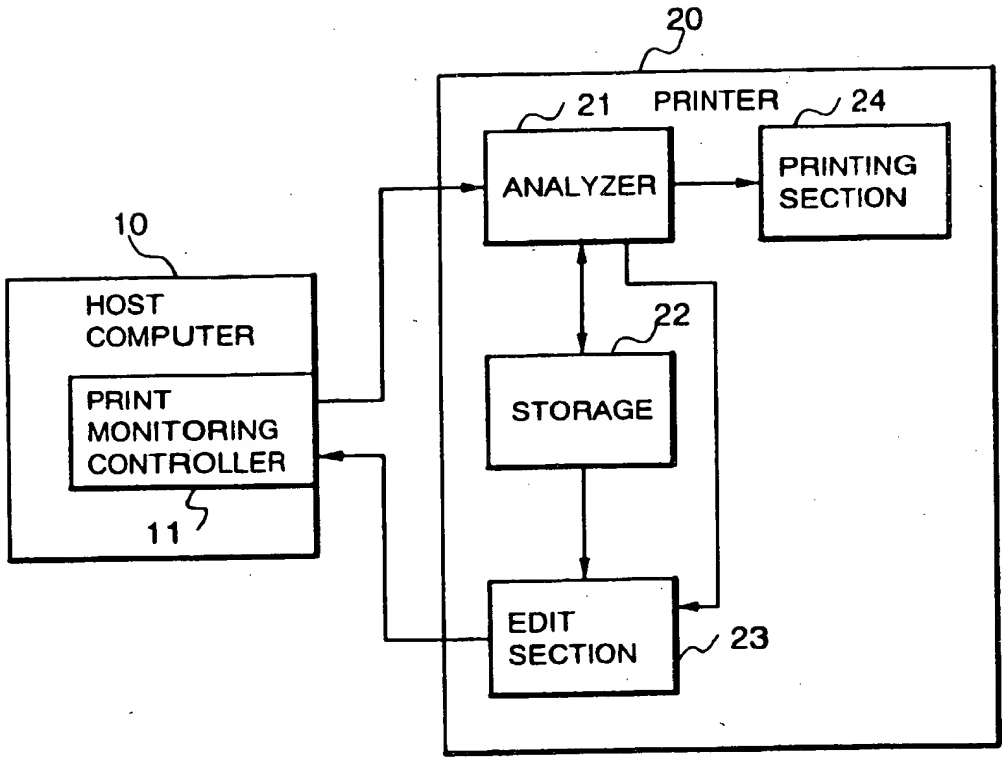

20
21
PRINTER
24
ANALYZER
PRINTING SECTION
10
HOST COMPUTER
22
PRINT MONITORING CONTROLLER
STORAGE
11
EDIT SECTION
23

FIG.2

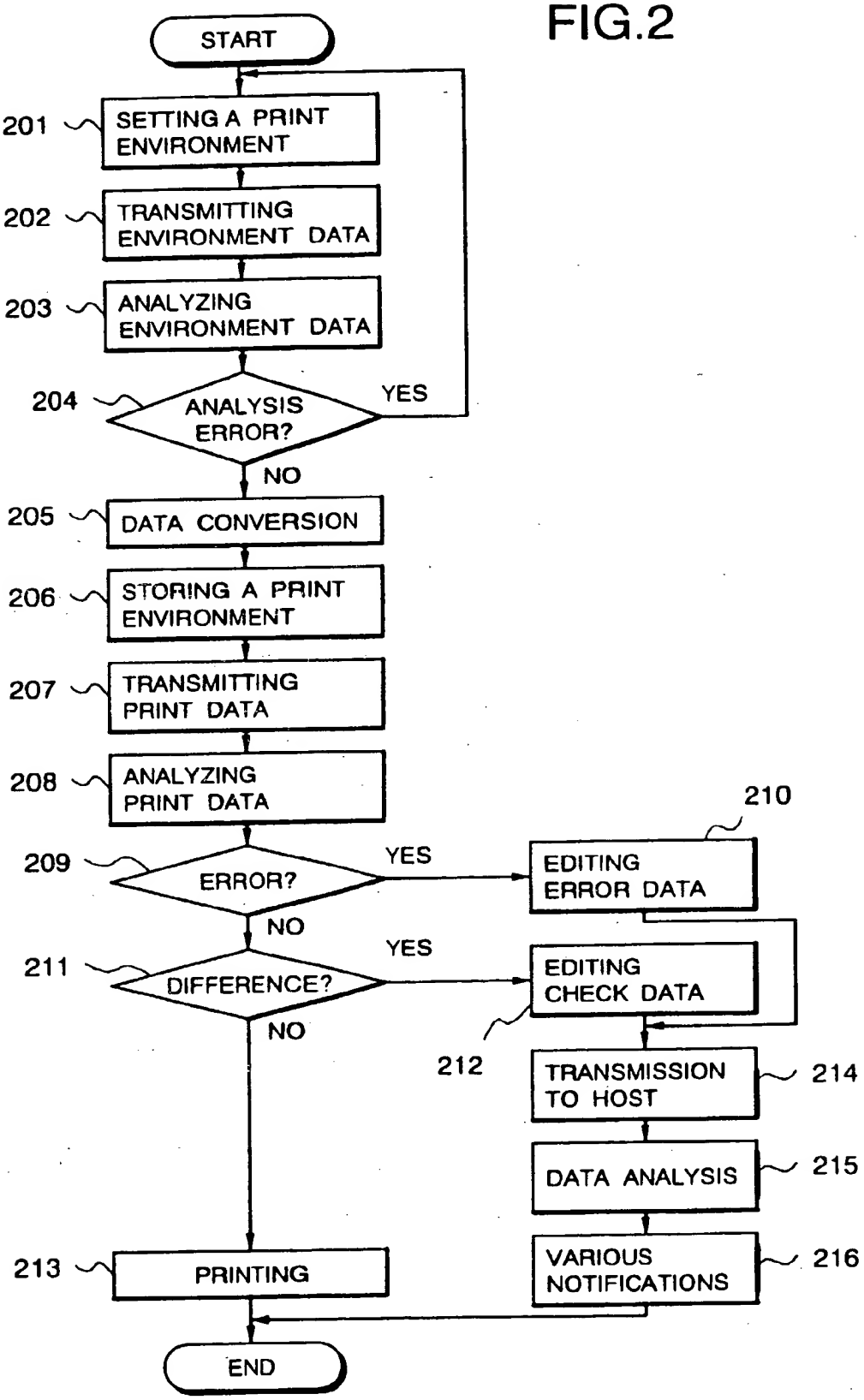

START
201
SETTING A PRINT ENVIRONMENT
202
TRANSMITTING ENVIRONMENT DATA
203
ANALYZING ENVIRONMENT DATA
204
ANALYSIS ERROR?
YES
NO
205
DATA CONVERSION
206
STORING A PRINT ENVIRONMENT
207
TRANSMITTING PRINT DATA
208
ANALYZING PRINT DATA
209
ERROR?
YES
NO
210
EDITING ERROR DATA
211
DIFFERENCE?
YES
NO
EDITING CHECK DATA
212
TRANSMISSION TO HOST
214
DATA ANALYSIS
215
VARIOUS NOTIFICATIONS
216
213
PRINTING
END

FIG.3

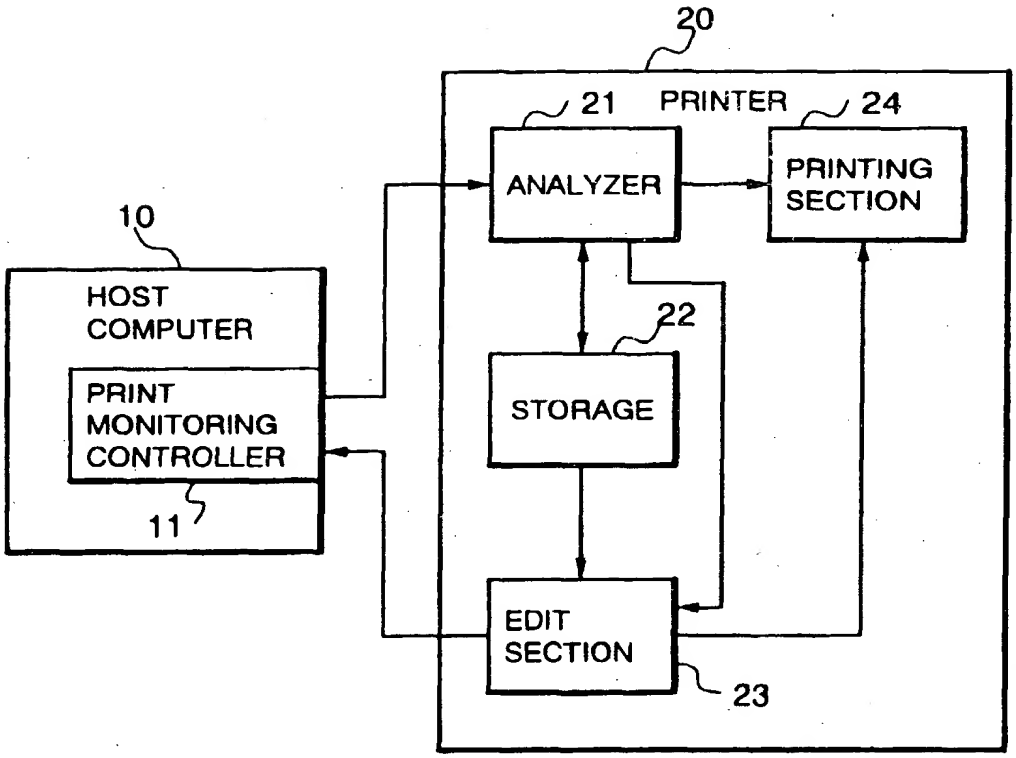
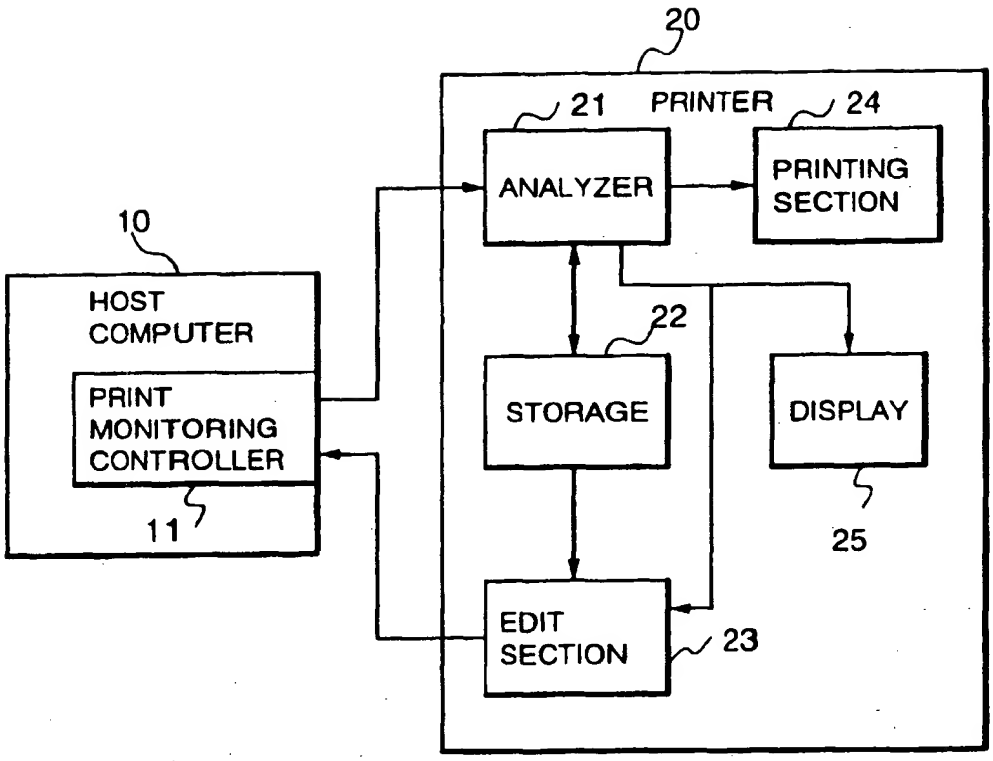

20
21
PRINTER
24
ANALYZER
PRINTING SECTION
10
HOST COMPUTER
PRINT MONITORING CONTROLLER
11
22
STORAGE
EDIT SECTION
23

FIG.4


20
21
PRINTER
24
ANALYZER
PRINTING SECTION
10
HOST COMPUTER
PRINT MONITORING CONTROLLER
11
22
STORAGE
DISPLAY
25
EDIT SECTION
23

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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 9481

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO-A-92 11596 (EASTMAN KODAK CO) 9 July 1992 * figures 1,2A,2B * * page 4, line 2 - page 8, line 23 *	1,3,4, 6-8,10, 11	G06F3/12
A	US-A-5 313 565 (MORI YOSHIO) 17 May 1994 * figures 3,6-10 * * page 5, line 1 - page 7, line 3 *	1,4,7,8, 11	
A	WO-A-94 11804 (MICROSOFT CORP) 26 May 1994 * figures 1-3,28 * * page 5, line 2 - page 12, line 14 *	1,4,7,8, 11	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) G06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 April 1996	Weiss, P

CATEGORY OF CITED DOCUMENTS

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